Enclosure 1

CRA Completeness Comments – 3rd set – August 2004

(Please refer to our previous completeness letters for comments numbered G-1 through G-9. Docket A-98-49, II-B3-72)

General Comments

G-10 Ground water basin modeling and ground water chemistry

Since DOE submitted the original certification application (CCA), new information has become available on the Culebra hydrology and potential recharge related to potash mining. The possibility of potash mining as a potential source of recharge could affect previous interpretations of the ground water chemistry and ground water basin modeling that was done for the CCA. DOE must update the ground water basin modeling and ground water chemistry to accommodate the possibility that potash mining is a potential source of recharge. DOE must also provide discussion on how this new information would or would not affect the current performance assessment.

G-11 Inclusion of omitted areas in mining transmissivity calculation

In section TFIELD-9.1 paragraph 2 of Attachment TFIELD the CRA states: "The current version of the map differs from the one used for the CCA calculations in that several areas north of the LWB have been ruled out as potential mining areas in the updated version due to recent oil and gas drilling in those areas." EPA does not agree with this approach.

In the WIPP Compliance Application Guidance (CAG), we explained that, in implementing this requirement for mining, DOE should examine the "estimated lives of existing mines and plans for new mines in the vicinity of the WIPP" and should "use mine-able reserves in estimating mine lives and the extent of potential mining." (See CAG, p. 45) That is, we expected DOE to look broadly at the *potential for* existing resources to be developed, without substantial deference to whether the leases were currently viable for development. The methodology in the CRA for mining outside the controlled area is inconsistent with this approach. We do not find that the presence of oil or gas drilling is a sufficient basis for eliminating potash mining areas from consideration, especially in light of anecdotal evidence that mining does occur in proximity to such boreholes. DOE must account for the potash mining areas that have been omitted from the current modeling.

G-12 Potential effects of heterogenous waste loading on chemical conditions

DOE has continued to assume that chemical conditions will be homogeneous (evenly distributed) throughout the waste disposal region. Current information regarding Panel 1 loading has indicates that waste is unlikely to be homogeneously (evenly) distributed throughout the repository. In addition, tight panel seals are likely to limit mixing of brine between panels in an inundated repository.

DOE must address the potential effects of heterogeneous (not evenly distributed) waste loading on the assumption of homogeneous chemical conditions throughout the entire repository as opposed to assuming homogeneous chemical conditions that exist only on a panel-by-panel basis.

G-13 Ligands potentially produced as aqueous metabolites

Recent experimental investigations of microbial degradation of CPR have indicated that potentially significant amounts of acetic and other organic acids may be formed as aqueous metabolites under inundated conditions (Gillow and Francis, 2003). The formation of these organic acids could be significant because these acids dissociate to form ligands capable of complexing actinides (for example, acetic acid dissociates to form acetate). However, the potential effects of the formation of organic acids during microbial degradation on the concentrations of ligands that could be present in the repository has not been considered.

DOE must assess the experimental evidence developed since the CCA to determine if significant amounts of ligands could be produced as aqueous metabolites during microbial degradation of cellulose.

G-14 Methanogenesis

DOE states that methanogenesis will be the dominant reaction for the microbial degradation of cellulosics, plastics, and rubbers (CPR) because of the limited amounts of nitrate and sulfate in the waste inventory. However, this argument neglects the sulfate that is present in the solids of the Salado Formation.

EPA reviewed the issue of the safety factor related to magnesium oxide as part of the review of the Idaho National Engineering and Environmental Laboratory (INEEL) Advanced Mixed Waste Treatment Facility (AMWTF) compacted wastes. We found (Docket A-98-49, II-B3-68) then that "the decision to use the methanogenesis pathway in the AMW PA, DOE did not consider the potential excess sulfate in the surrounding waste area environment, including the brines and anhydrite marker beds. EPA raised this issue and requested DOE to further analyze the potential for the existing sulfate to affect the methanogenesis assumption." DOE did provide additional information (Kanney et. al, 2004; Docket A-98-49, Item II-B2-33) on the topic but because of the uncertainty, such as with the potential source of sulfates in the repository, we disagreed with DOE's conclusion in that study. Subsequent to our review of the AMWTF, and during an underground inspection, we identified that there was additional, previously unaccounted for, sulfate in the underground in the form of discontinuous anhydrite "stringers" above the roof in the newly mined Panel Three, validating our concern of additional sulfate sources.

DOE needs to provide EPA with new and convincing evidence that methanogenesis will be the dominant reaction. If not, DOE must assume that microbial degradation of CPR will take place through denitrification and sulfate reduction when calculating the maximum amount of carbon dioxide that could be produced by microbial degradation of CPR.

Content of Compliance Applications

C-14-1 Figure 2-37 revision

Figure 2-37 does not include the data points from which the contours were drawn. Additionally, the figure does not indicate the monitoring cycle/time period represented by this surface, and related text does not indicate whether there are mappable fluctuations in the potentiometric surface based on the monitoring period. DOE must revise Figure 2-37 to include this information, and to address periodicity associated with water level fluctuations, if observed. If water level fluctuations were not observed, DOE should so state.

C-14-2 Background conditions since CCA

DOE has removed discussion of all "background" environmental conditions, but does not address how information obtained since the approval of the CCA may have affected these "background" conditions. For example, groundwater monitoring has occurred for several years, yet the discussion pertaining to Water Quality remains unchanged with respect to the hydrochemical facies.

C-14-3 Post-CCA seismic events

The CRA includes a discussion of seismicity in the WIPP vicinity, but does not discuss post-CCA seismic events. If no events occurred, the CRA should so state. Additionally, Figure 2-57 does not clearly present events that are "post CCA", even though the title of the figure implies that it includes these events. DOE needs to identify the seismic events that have occurred since the CCA.

C-15-1 Compacted waste in or planned for inventory

In our review of the Advanced Mixed Waste Treatment Facility we were informed that only INEEL would have compacted or supercompacted waste. It has recently come to our attention that other waste generator sites have compacted waste or may plan to compact waste in the next several years. DOE must provide EPA with information on which sites may plan to compact or super compact wastes in the next five years as well as identify which waste streams that could be affected and verify that compacted waste is appropriately included in the CRA PA.

Performance Assessment

C-23-11 95 percent confidence interval

On page 6-188, Figure 6-38 the CRA provides a graphic that indicates the 95 percent confidence interval about the mean. For completeness, please provide the actual interval values for the regulatory probabilities of 0.1 and 0.001 for the CRA and the PAVT.

C-23-12 Documentation for chemical benefit of MgO emplacement

The CRA introduces a statement about the methodology for MgO emplacement and a particular chemical benefit, "*(3) minimizes the exposure of periclase, the main, reactive constituent of MgO, to atmospheric carbon dioxide* (CO_2) *and water prior to rupturing of the supersacks*". This information was not part of the original CCA and no reference or justification for the statement is provided in the CRA. DOE must provide summary information in the CRA and cite references which explain and support the statement.

C-23-13 Organic ligand complexation on (V) and (VI) oxidation state actinides

DOE discusses the effects of organic ligand complexation on the (III) and (IV) actinides, given the new data on organic ligand complexation developed since the CCA (Choppin et al., 2001). However, DOE does not address the predicted effects of organic ligand complexation on the (V) and (VI) actinides, given these new data. DOE must provide this discussion.

C-23-14 Identification of relevant non-WIPP actinide solubility data

DOE does not discuss whether additional, potentially relevant actinide solubility data developed outside the WIPP program has become available since the CCA. DOE must address whether additional solubility or other data have been developed that may be relevant to the solubility calculations.

C-23-15 Organic ligand sensitivity

DOE states that no upper or lower limit need be established for the quantities of organic ligands in the repository because organic ligand concentrations in the solubility calculations had an insignificant impact on actinide solubility. However, review of SOTERM-5.0 does not indicate that a sensitivity analysis was conducted to establish that no upper limit on organic ligands is required. Because new thermodyanamic data are available for organic ligands at high ionic strength, the CCA analysis of the potential effects of organic ligands carried out using low-ionic-strength data may no longer be valid.

The concentrations of actinides calculated for the CCA and CRA are compared in Table 6-13. Comparison of the concentrations in the two sets of calculations indicates that there are significant differences in some of the calculated solubilities for the +III and +V actinides. Based on information in Appendix SOTERM, the principal difference in the solubility calculations appears to be the inclusion of the effects of organic ligands.

DOE must provide an assessment of the sensitivity of calculated actinide solubilities to organic ligand inventories in the waste.

C-23-16 Actinide solubility uncertainty

DOE used the differences between modeled and measured actinide solubilities to estimate the uncertainties associated with actinide solubilities for the PA. Based on the figure presented in the CRA (Figure SOTERM-1), it appears DOE used the solubilities calculated for the CCA rather than for the CRA. However, DOE indicates that solubilities calculated for the CRA were different than the CCA (Table SOTERM-2).

DOE must re-evaluate the uncertainties associated with actinide solubilities using solubilities calculated for the CRA, and use this information in the CRA PA.

C-23-17 Metal/organic ligand competition for actinides and solution ionic strength

DOE presents calculations performed for the CCA to estimate the effects of other metals competing with actinides for organic ligands, which were carried out using parameters obtained at low ionic strengths. At the time of the CCA, parameters were not available for WIPP-relevant high-ionic-strength solutions. However, additional data have become available since the time of the CCA.

DOE must address whether the low-ionic-strength calculations discussed in this section are still valid in light of the high-ionic-strength data that have been developed for organic ligands.

C-23-18 Sensitivity of top ten releases

The results of a stepwise regression analysis of mean total normalized releases are presented in Section PA-9.6, Table PA-31 for the four most important parameters. Sensitivity analysis results for incremental releases are also presented by release pathway for the parameters identified as most important. This information is found in Sections PA-8.4.3 and PA-8.4.4 for releases through the Culebra, in Section PA-8.5.1 for cuttings and cavings, in Section PA-8.5.2 for spallings, and in Section PA-8.5.3 for direct brine releases. At most, the sensitivity results are limited to about 5 parameters and comparative, quantitative results are not always shown. DOE needs to identify the importance of the top ten sampled parameters relative to final releases, similar to the table with the top four parameters, and for releases from each release pathway.

C-23-19 Identification and justification for changes to all parameters

Comparison of CRA Attachment PAR with the CCA indicates that the number of sampled parameters has increased from 57 to 64. The DOE identifies these in CRA Appendix PA, Section 5.0 and provides a discussion and references to documentation justifying the changes in the sampled parameters for the CRA in the Parameter Sheets in CRA Appendix PA, Attachment PAR. However, the data sheets provided in CRA Appendix PA, Attachment PAR only address sampled parameters that are still being used; they do not address parameters that were removed (see Table PA-18 in CRA Appendix PA). DOE should provide a brief discussion justifying the removal of those parameters identified in Table PA-18 as being removed from the database), including citation of appropriate reference documentation.

In addition, changes to the parameters not selected for sampling are not identified in Appendix PA Attachment PAR and no discussion is provided for changes from the CCA to the unsampled parameters in CRA Attachment PA.

DOE must identify and provide a brief discussion justifying changes for ALL (sampled and constant) parameters changed since the CCA and used in the CRA, including citation of appropriate reference documentation (not just the sampled parameters). This discussion is to include parameters whose values were changed/over-ridden from the values in the PA parameter database (PAPDB) for use in the CRA, and any parameters used in the CRA that are not in the PAPDB.

C-23-20 Exclusion of parameter correlations

Comparison of this section with the relevant section in the CCA Appendix PAR indicates that two examples of induced parameter correlations have been excluded in the CRA. These are: (1) the underlying variable americium properties and the defined variable curium properties (NUTS, PANEL, and SECOTP2D) and (2) the underlying variable CUMPROB and the defined variables of time-dependent permeabilities of the compacted salt seal permeabilities in the shaft. Were these excluded because they are no longer considered correlated, they are treated differently in the CRA or why? The wording in this section implies the list is not all inclusive, but why remove two examples?

DOE must document why these two examples were removed from the list or add them back in to the list.

Waste Characterization

C-24-5 Inclusion of information on complexing agents, nitrates and phosphates

The CRA states that a summary of complexing agents, nitrates, phosphates and cements is included in Appendix DATA, Attachment F. However, Appendix F does not include summary information on these components, just the detailed data sheets. The detailed waste stream descriptions in Annexes I, J, and K of Attachment F contain volume information for cements. However, it does not appear that complexing agents, nitrates, or phosphates were specifically included in these profiles.

The specified summary information as well as the waste stream specific quantities for complexing agents, nitrates, and phosphates must be included in the CRA; DOE needs to provide this summary and waste stream detail information, including justification as to why the occurrence of complexing agents, etc. was limited to solidified waste forms.

C-24-6 Importance and nature of waste stream profile inconsistencies

The preface of Appendix DATA, Attachment F indicates that there are still several inconsistencies in the Waste Stream Profiles. However, the Preface does not clearly indicate the nature of these inconsistencies. Because DOE indicated that the inconsistencies were not significant to PA but did not provide information on these inconsistencies, EPA cannot verify this conclusion.

DOE must identify the location of or provide a summary listing of the types of identified inconsistencies in the Waste Stream Profiles as referred to in the Preface of Appendix DATA, Attachment F, and justify why these inconsistencies are not important.

C-24-7 Impact of waste loading within TDOP containers

The CRA did not include any discussion of waste loading within TDOP containers and what impact that may have on the PA. DOE is currently loading TDOPs with a combination of drums that when averaged meets the required composition for disposal of TRU waste at the WIPP. The TDOPs could contain combinations of different waste classifications (low-level, TRU, dunnage) and the impact of the variability of radionuclide concentrations and waste materials within the TDOP is not addressed in the CRA. DOE must address the potential impact of waste loading management within TDOPs on the PA. Although this activity was not fully implemented until after the Sept 2002 cut-off date, it was clearly being planned for use prior to this date and so should be recognized as an activity in the CRA.

Application of Release Limits

C-31-1 ORIGEN 2.2 decay model

A reference to the description of the input data to the ORIGEN 2.2 decay models is required in order to verify proper decay modeling.

Scope of Performance Assessments

C-32-1 Nuclear criticality possibility with non-random waste loading

CRA Section SCR-6.2.1.4 eliminates nuclear criticality as a possible source of heat by arguing that the average concentration of ^{239}Pu and ^{235}U is well below a level that could credibly produce a critical configuration. This argument may no longer be valid, since it relies on an average repository concentration rather than actual repository loading information. The possibility of criticality occurring on a local as well as on a repository averaged scale must be analyzed. Even though the overall radioactivity in the disposal system is lower than in the CCA, the specific question at issue is whether the heterogeneous emplacement of the waste and the potential higher concentration of radionuclides in areas modifies the current screening assumption of evenly distributed radionuclides and the finding of low probability of occurrence for this scenario.

Monitoring

C-42-5 Status of all monitoring programs

It is unclear whether some monitoring programs have been eliminated (e.g, biological monitoring) while others appear to continue. DOE needs to specifically list the status of all of the monitoring programs used or to be used to demonstrate compliance with EPA requirements in the CRA, as some of the edits make it questionable whether some of the previous programs will be continued.

C-42-6 Location where Appendix DATA Attachment C tables are analyzed

A reference to where in the CRA the data in the tables from this appendix are analyzed and shown to prove continued compliance with requirements is needed. It is obvious from looking at the graphs that there are some anomalous data that may require explanation, as well as some trends in concentrations, particularly for potassium (generally slight increase in concentration over time). To be complete, DOE needs to reference where in the CRA this discussion occurs.

Consideration of Underground Sources of Drinking Water

C-53–1 Reference to support NUTS code tracer exercise

There is no reference provided to support the NUTS code tracer exercise which is used to scale the anticipated releases of ^{226}Ra and ^{228}Ra since they are not calculated by NUTS. The scaling factor has changed from 2.5E-7 kg/m^3 to 1.025E-7 kg/m^3, but a new tracer exercise is not referenced to support the change in the scaling factor. It is not clear if the reference associated with the maximum concentration of Ra in the accessible environment (Wagner, 2003) also discusses the scaling factor. In addition, the reference for Table 8-6 is incorrectly cited: the author is Fox, not Leigh, and the reference only discusses activities, not mass loadings–these have been calculated from activities–but there is no reference or documentation cited.

References Required

R-23-1

Leigh and Lott. 2003. Estimate of Portland Cement in TRU Waste For Disposal in WIPP for the Compliance Recertification Application, Supercedes ERMS #529684, Revision 1. Routine Calculation ERMS #531562 Carlsbad, NM: Sandia National Laboratories.

R-23-2

Leigh and Sparks-Roybal. 2003. Final Estimate of Oxyanion Mass in TRU Waste for Disposal in WIPP for the Compliance Recertification Application. Routine Calculation. ERMS #530984. Carlsbad, NM: Sandia National Laboratories.

R-23-3

DOE has not provided or referenced any of the relevant information that documents the adequacy of the computer codes (e.g., Design Documents, Verification and Validation Documents, Analysis Plans etc.), although draft versions of some of these documents have previously been reviewed by EPA. DOE must provide this documentation.

R-23-4 (Section 6.4.3.5)

The reference Helton (1998), cited during a discussion of important actinides in the repository on page 6-92, appears to be missing from the reference list or should be listed as Helton et al (1998) for which there is a reference. Please clarify.

R-7-1 (Section 7.3.2)

John Hart and Associates, P.A. 2000a. Contractor Report, Permanent Markers Monument Survey, Waste Isolation Pilot Plant, Carlsbad, NM.

R-7-2 (Section 7.3.2)

John Hart and Associates, P.A. 2000b. Contractor Report, Permanent Markers Materials Analysis, Waste Isolation Pilot Plant, Carlsbad, NM.

R-7-3 (Section 7.3.2)

John Hart and Associates, P.A. 2000c. Contractor Report, Ancient Cementitious Materials, Waste Isolation Pilot Plant, Carlsbad, NM.

R-7-4 (Section 7.3.2)

Not cited in reference section but referenced in Section 7.3.2: Permanent Markers Testing Program Plan, Waste Isolation Pilot Plant (DOE 2000)

R-24-2 (Section 4.1.3.3, Appendix DATA Annex F)

Giambalvo, E. 2002. "*Sandia's WIPP Inventory Data Needs for Performance Assessment*," Letter to J. Harvill, April 22, 2002, Sandia National Laboratories, Carlsbad, NM. ERMS # 522011.

R-MON-1 (Appendix MON)

Wagner, S. W., and R. Kirkes. 2003. "MONPAR Reassessment," December 2003. Carlsbad, NM. Sandia National Laboratory. ERMS 533098.